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Assessing the Collateral Damage of the Novel Coronavirus: A Call to Action for the Post–COVID-19 Era

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As of April 20, 2020, coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2, has killed over 170,000 people worldwide, and mortality projections for the United States have been as high as 200,000.[1] Health systems have been pressed with an uncomfortable reality to rapidly adapt to the growing burden of COVID-19 patients requiring critical care. This comes at the expense of elective surgeries, which are increasingly being cancelled across the world. Here, we explore the contemporary issues impacting healthcare resources during the pandemic and make recommendations for identifying an appropriate balance of their use to optimize patient care.

Impact of Current Resource Allocation

While necessary precautions must be taken to optimize patient care and the paucity of available resources in equipment, personnel, and infrastructure, collateral damage is inevitable (Figure 1). The following is anticipated in different time frames or waves:

First Wave: COVID-19 Infections and Burden on the Healthcare System

CARDIOVASCULAR DISEASE AS A POOR PROGNOSTIC FACTOR. Cardiovascular disease (CVD) is associated with a higher death rate in patients with COVID-19 (13.2%) compared with other comorbidities, including diabetes (9.2%), chronic respiratory disease (8.0%), hypertension (8.4%), and cancer (7.6%).[2] As such, the ethical obligation of physicians to prioritize the well-being of individual patients may be overridden by a delicate balance of policies that aim to prioritize the greatest good for the greatest number of patients: premature withdrawal or cessation of care in cardiovascular patients, or "Do not resuscitate" or "Do not intubate" in elderly patients with COVID-19 and perceived limited life expectancy, in order to reallocate resources to those with a better prognosis.[3] Conversely, by delaying patients with underlying CVD, they may be faced with a worse prognosis if they become infected with COVID-19.

A REDUCTION IN HEALTHCARE PERSONNEL, LIMITING ACCESS TO CARE. Healthcare workers themselves are at substantial risk for severe acute respiratory syndrome coronavirus 2 infection because of increased exposure to high viral loads.[2] Additionally, increased rates of burnout among health workers and cases of posttraumatic stress disorder as a result of frontline experiences can lead to a shortage of professionals trained to care for patients.[3]

BLOOD BANK SHORTAGES. Social distancing and lack of COVID-19 test kits for blood donors have led to a substantial decline in the availability of blood products. Although elective procedures requiring blood products are cancelled at most institutions, surgical emergencies may still necessitate blood reserves to optimize outcomes.

Second Wave: Delayed Care and Presentation for Patients With CVD

DELAYED ROUTINE SCREENING. Recommended screening for malignancies (eg, colorectal cancer), predisposed conditions (eg, diabetes), and preexisting comorbidities (eg, cardiac stress tests) may be partially postponed for an indefinite time until hospitals can reasonably manage existing patient loads. This will likely negatively impact their prognosis and lifespan.

DELAYED PRESENTATIONS OF PATIENTS WITH PROGRESSIVE DISEASE. For example, the recommendations for "lockdown" to "flatten the curve" may deter some patients (eg, patients with chest pain, node positive lung cancer) from seeking time-sensitive care, out of fear or lack of access to transportation. They may be forced to or otherwise elect to "wait out their symptoms," which could pose substantial risk.

DECLINES IN TRANSPLANTATION PROCEDURES. Given the risks associated with procurement team travel, combined with increased infection risk in recipients who will be immunosuppressed postoperatively, nonurgent transplantations may be delayed.

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Ann Thorac Surg 2020;110:757-60 • 0003-4975/$36.00
https://doi.org/10.1016/j.athoracsur.2020.04.015

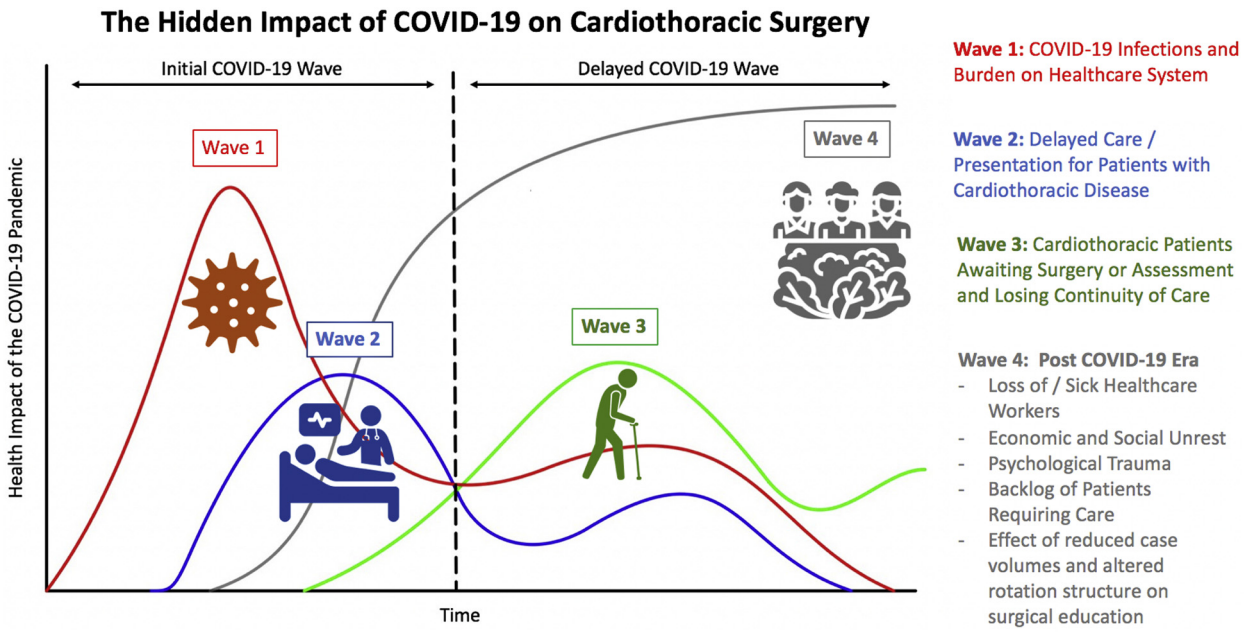

Figure 1. The health impact because of the novel coronavirus disease 2019 (COVID-19) and collateral damage caused by impeded access to non–COVID-19 care. The first wave represents COVID-19 patients during the initial and delayed COVID-19 phase. The second wave represents non–COVID-19 patients requiring urgent or emergent cardiothoracic surgical care, and patients with late presentations. The third wave represents stable patient cohorts awaiting surgery but losing continuity of care. The fourth wave represents the socioeconomic and mental health impacts on patients and healthcare workers, as well as implications for reduced clinical workload for cardiothoracic surgery trainees and fellows. Adapted with permission from @VectorSting, As our friends and colleagues brave the font lines, we must also get ready for a series of aftershocks. It's very hard to plan this far ahead while we're in survival mode. We must prepare early and strategize our response to the collateral damage of #COVID19. (Available at: https://twitter.com/vectorsting/status/1244671755781898241, Posted March 30, 2020, with permission from Victor Tseng.)

Third Wave: Cardiothoracic Patients Awaiting Surgery or Losing Continuity of Care

REDUCTION IN PREVENTIVE MEDICINE. The acute measures to stay at home and social distancing may lead to a myriad of negative effects in mental health, physical well-being, and other lifestyle behaviors. Additionally, the shift in priority of primary care to triage of suspected COVID-19 patients may limit the time available for routine visits (eg, tracking CVD risk factors, such as hypertension, cholesterol, and diabetes, which have previously demonstrated survival benefit), supporting smoking cessation, and providing psychosocial support, despite the emergence of telehealth visits.

Fourth Wave: Long-term Post–COVID-19 Impact and Beyond

EDUCATION AND TRAINING. As cardiothoracic surgical cases are cancelled and trainees are redeployed to areas of need, surgical trainees will increasingly find themselves with the challenge of balancing service and education. Some institutions are alternating residents and changing rotational structure. Coupled with a dramatic reduction in elective case volume, training opportunities are greatly diminished. Moreover, large-group and intermediate-group didactic and process improvement meetings are routinely being cancelled. Because training in cardiothoracic surgery is over such a short amount of time—ranging from a minimum of 2 years via fellowship to a minimum of 6 years via integrated programs—the long-term impact of multiple lost months may be substantial.

As healthcare workers are redeployed to care for COVID-19 patients, and resources such as ventilators and extracorporeal membrane oxygenation devices are utilized to stabilize critically ill COVID-19 patients, the capacity to treat CVD and emergencies remains critically limited. The decision to subject cardiovascular patients to surgery is difficult yet fluid, and with limited evidence-based guidelines, as illustrated by the spectrum of CVD. While hemodynamically unstable patients are quickly moved to the operating room if pharmacological and noninvasive care has failed, the timing to intervene on clinically stable patients may not be as clear. In the context of heart transplants, United Network for Organ Sharing status 1 to 3 patients ought to be prioritized wherever possible, while those of lower status are left in the dark.[4] Newborns with single ventricles or prostaglandin dependence should clearly be managed, but what about children with valve insufficiency or large septal defects? Healthcare professionals are increasingly faced with important ethical dilemmas that are unique to the traditionally high-resource settings they have been operating in. The Society of Thoracic Surgeons has provided important ethical guidelines and tiered triage guidance statements for cardiac surgery, congenital heart surgery, and thoracic malignancies.[3,5-7] Furthermore, they have also developed important resource utilization prediction tools based on data from the Society of Thoracic

Surgeons Database to assist healthcare providers in making informed decisions regarding resource allocation and triage of patients.

Recommendations

As we move forward in this physical and emotional war, we propose the following for all healthcare professionals alike.

First, real-time outcomes tracking will better inform the development of disease-specific guidelines for specialty care during pandemics, as well as the interaction between COVID-19 and preexisting surgical conditions. Rightfully so, there is focused attention on outcomes tracking of patients who develop COVID-19. However, we urge the medical community that the tracking of outcomes of non–COVID-19 patients is equally important to better inform us of not only the mortality rates of COVID-19, but also its collateral damage because of patients' reluctance to seek care, or the absence of otherwise routine care. The use of digital health technologies should be employed to longitudinally track patients initially scheduled for elective surgery. For example, the inclusion of real-time tracking for cardiac mortality would result in a real-time impact of decision making (ie, if mortality from CVD dramatically increases, a corrective course may be developed in real time).

Second, we must remain committed to, and available for, all patients—COVID-19 or not—as a way of ensuring population health. This strategy may also assist in keeping comorbidities under control, especially as their propensity complicates the potential COVID-19 disease severity course. Decentralization of care and the use of telemedicine to consult patients from their own homes is necessary to maintain an optimal patient-doctor relationship, while providing preventive care, triaging of new conditions, and comprehensive health counseling. These aspects may be supplemented by the use of emerging telemonitoring and cardiac wearables that can also track patients' vital signs as well as serve as portable point-of-care testing. Additionally, dedicated multidisciplinary virtual triage rounds, if feasible, may be initiated to convene healthcare professionals to discuss the care of patients whose procedures have been cancelled or whose health status has changed.

Third, patient and community education is critical to flatten the epidemiological curve, while ensuring that patients understand when to seek care, led by example by physician leaders. Establishing virtual emergency care triage is essential, and can allow for timely patient evaluation without subjecting them to unnecessary travel to the emergency department. Empowering patients to self-access information via their electronic medical record and digitization of patient support groups via chat groups, smartphone applications, real-time videoconferencing, and remote rehabilitation can help to improve patient engagement and health literacy.

Fourth, hospitals have instituted patient-centered policies and should further develop guidelines to centralize and streamline urgent cardiovascular care in this rapidly changing era. These include ensuring that a separate emergency team remains active and able to accept cases; minimizing crossover infections among patients and health workers; dedicating select hospitals, catheterization labs, operating rooms, and wards to non–COVID-19 patients; and allowing other healthcare personnel to become available when COVID-19 patients surge. Furthermore, it may include the need to have dedicated hospitals caring for COVID-19 patients only, while other hospitals outside heavily hit areas take care of non–COVID-19 patients. Last, attention should be paid to preparing patients for postacute care and rehabilitation to reduce care fragmentation and offload the burden from acute care centers.[8]

Fifth, a balance should be struck between cancelation and delaying of elective surgical procedures and the reallocation of surgical patients to non–guideline-directed therapies (eg, thrombolytics vs revascularization for acute coronary syndromes). Likewise, early-stage malignancies, small aneurysms, and asymptomatic congenital heart defects may be postponed to prioritize urgent interventions and COVID-19 critical care. However, this must be weighed against timely intervention for patients with potentially life-threatening illnesses. The importance of the multidisciplinary heart-team approach, in close collaboration with the hospital ethics and palliative care committee, cannot be overstated.

Sixth, professional societies need to continue to rapidly develop policies benefiting frontline workers to take appropriate action and effectively communicate them. Initial examples have been set by the Cardiothoracic Surgery Network and Canadian Cardiovascular Society (developing guidelines and town halls) and The Society of Thoracic Surgeons (launching its Resource Utilization Tool for Cardiac Surgery and virtual COVID-19 resource portal) and can be supplemented by clear guidelines such as the joint consensus statement on thoracic malignancies from the Thoracic Surgery Outcomes Research Network, The Society of Thoracic Surgeons, and the American Association for Thoracic Surgery.[7,9] Comprehensive consensus statements and guidelines that provide further guidance in the management of all cardiothoracic surgical diseases in each stage of the surge of COVID-19 are needed and can help alleviate the COVID-19 burden wherever possible.

Last, the integrity of surgical training and the sustainability of the workforce should be maintained. Trainee wellness and safety should be priority. In addition, restructuring of workflow and adaptation of educational milestones can help minimize disruption to surgical training.[10] E-technology can help provide continuity in academic and simulation curricula as well as allow flexibility in interviews and licensing examinations. However, such virtual education platforms will require rapid adoption by programs and growing understanding and familiarity by both trainees and faculty. Furthermore, it is important to recognize that competency is not determined by case numbers.[10] Maintaining a rigorous standard for surgical competency during a pandemic calls for a thoughtful and coordinated national approach. This

may highlight the need for development and integration of advanced simulation in present day training.

As the COVID-19 pandemic continues, clinicians and policymakers must be weary of the potential collateral damage on non–COVID-19 patients, health workers, and health systems. The decisions we make now will have important longitudinal implications on patient care as well as healthcare worker well-being. The surgical workforce should continue to take the necessary steps to protect themselves, COVID-19 patients, and importantly, non–COVID-19 patients. Cardiovascular surgical emergencies, traumatic injuries, obstetric complications, and congenital malformations will continue to occur, and will likely expose the weaknesses of the already burdened health system. However, sound judgement and calculated responses—proactive rather than reactive—are vital to ensure the robustness of our health system and to promote population health. We providers have the responsibility to all of our patients to make sure our resource allocation does more good than harm.

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